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VOYAGES TO THE MOON

By Heber D. Curtis

> ". . . Yet I do seriously, and upon good Grounds affirm it possible to make a Flying-Chariot; in which a Man may sit, and give such a Motion unto it, as shall convey him through the Air. And this perhaps might be made large enough to carry divers Men at the same time, together with Food for their *Viaticum*, and Commodities for Traffick. . . .
>
> So that notwithstanding all these seeming Impossibilities, 'tis likely enough, that there may be a Means invented of Journeying to the Moon; and how happy shall they be, that are first successful in this Attempt?"

Thus wrote the Right Reverend John Wilkins, Lord Bishop of Chester, in 1638.[1] The Bishop's prophetic vision of the modern air plane, and his views regarding the Moon as a possible abode of life, rest upon arguments derived largely from the Fathers of the Church, and there are few pages of this interesting old work without a Latin, Greek, or Hebrew quotation. It is doubtful whether there was in existence in the world at this time a telescope with an aperture as large as three inches, and speculation could still be untrammeled in seeking explanations of the lunar craters and "seas."

The march of geographical knowledge has made it increasingly difficult for the modern novelist to find suitable locations for a new Atlantis or Utopia. Swift had nearly the entire globe from which to select the localities of his Brobdignag and Lilliput. But Tibet, Central Australia, the wastes of inland Arabia, or the Gran Chaco, are no longer available. Central Africa is no longer a blank on our maps; Amundsen and Scott have made impossible the south polar "depression" in which were placed the strange, antithetical, pleasure-hating, misery-loving people of "A Strange Manuscript Found in a Copper Cylinder." The lot of the speculative novelist is now indeed a hard one.

Mars, of course, is still available, now that the Earth is so completely criss-crossed with explorers' tracks, but the difficulties of transportation or communication form a potent deterrent, in spite of sensational press reports of mysterious wireless signals.

Strange to say, not even the great astronomical progress of the past half-century has completely removed the Moon from the field of fiction as a suitable location for the strange or unknown. Perhaps the most interesting of all the various "trips to the Moon" in literature, H. G. Wells' "First Men in the Moon," appeared as late as 1901.

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[1] The Discovery of a New World; Or, a Discourse tending to prove, that 'tis probable there may be another Habitable World in the Moon. With a Discourse on the Possibility of a Passage thither. London, 1638.

Earliest of all the lunar journeys was Thomas Godwin's "The Man in the Moone; or, a Discourse of a Voyage thither by Domingo Gonzales," written about the year 1600, but published posthumously in 1638. Somewhat vague as to means of reaching the Moon, as have been, of necessity, all novelists save Verne, Godwin's accounts of the curious, winged, but man-like inhabitants, their life and government, are witty and full of interest. Godwin was one of the earliest supporters of the Copernican theory, and his account of this voyage to the Moon is believed to have given Swift his idea of the floating island of Laputa.

Later, and probably suggested by the works of Wilkins or Godwin, came Cyrano de Bergerac's "Histoire comique, ou voyage dans la Lune," published in 1662.

The purpose of these earlier works was, in general, satirical, contrasting lunarian customs and ethics with our own. It remained for Jules Verne (1865) and H. G. Wells (1901) to give an air of plausibility to their stories by drawing upon all the resources of science or pseudo-science in the methods employed for reaching our satellite. All remember Verne's device of an enormous cannon, located in Florida, which shot the voyagers to the Moon in a mighty steel projectile, the details of which seem quite medieval to the reader versed in the mechanical progress of the half-century which has elapsed since Verne wrote. Wells made use of a great steel sphere, endowed with a sort of mysterious negative gravity. His Lunarians, insects in form, differentiated in structure far more than ants or bees for their places in the lunar kingdom, lived in caves far beneath the actual surface of the Moon, where the atmosphere was dense enough to support life.

Edward Everett Hale's "The Brick Moon" (1873), a delightfully whimsical tale, deals, not with a journey to the Moon, but with a hollow brick (!) moon two hundred feet in diameter, which, with its passengers, became a satellite moving close to our Earth's surface.

Last of all, tho earlier in point of time, come two works of a different nature. These are Edgar Allen Poe's "Unparalleled Adventure of one Hans Pfall," published in 1835, and Richard A. Locke's "Moon Hoax," published in the New York *Sun* about three weeks after the appearance of Poe's story, and doubtless suggested by it. Poe ends his tale of Pfall's balloon voyage to the Moon in such a way that there is no doubt of its character as a hoax. Locke's, however, had such verisimilitude when viewed in the light of the rather crude science of that date, that it was accepted without question by thousands, and forms perhaps the most successful and certainly the most famous hoax ever perpetrated. Locke was at that time the editor of the New York *Sun*. The public knew that Herschel had gone to the Cape of Good Hope for astronomical observations with a powerful telescope, and was accordingly ready to believe almost anything about him and his results, as long as it appeared to have any reasonable scientific consistency, a quality which Locke very cleverly incorporated in his account. Even today this delicious hoax forms most entertaining reading, and some details from the little pamphlet, now quite rare, may be of interest to readers of the PUBLICATIONS. The title runs:—

History of the Moon
or an account of the
Wonderful Discoveries
of
Sir John Herschel,

Who, by means of an Object Glass weighing Seven Tons, with a magnifying power of 42,000 times, has been enabled to discover in the MOON, Rocks, Trees, Flowers . . . and more wonderful still, intelligent *winged* beings, Male and Female, who fly about, and walk erect like men.

The object glass was stated to be twenty-four feet in diameter, and the image in the focus was illuminated by an oxy-hydrogen light, *to make it bright enough to magnify again*, so that a power of 42,000 was attained, a device which reads plausibly yet—to one who knows no optics. The lunar inhabitants were seen to possess wings, were about four feet high, and of unusually intelligent countenances! This supposititious letter of Herschel's was accepted by the press of the world, printed and reprinted, widely discussed among scientists, and almost universally believed. It was not until Sir John Herschel had published an authentic account of his observations at the Cape that all faith in the hoax was abandoned.

Recent reports in the daily press, sent out under the auspices of the Smithsonian Institution, describe a new type of rocket for which the claim is made that it is theoretically possible, by its means, to reach the Moon. Doubtless most of those who have read this announcement have been irresistibly reminded of Jules Verne's moon-reaching projectile. Not a few, perhaps, sharing the American public's universal distrust of all newspaper "science," have mentally classified the announcement as of precisely the same scientific value as Verne's famous story.

A brief outline of Dr. Goddard's[2] experiments on rockets and the theoretical conclusions reached by him may serve to make the matter clearer. Dr. Goddard's paper deals with experiments on the efficiency of various types of rockets, carried out in the physical laboratory of Clark University, under a grant of $5,000 from the Hodgkins Fund of the Smithsonian Institution. The investigation was in part preliminary to the design of a heavy, multiple-charge rocket for military use, and in part an attempt to provide means by which recording instruments could be carried to heights of fifty or more miles above the Earth's surface and thus obtain meteorological data of very great value.

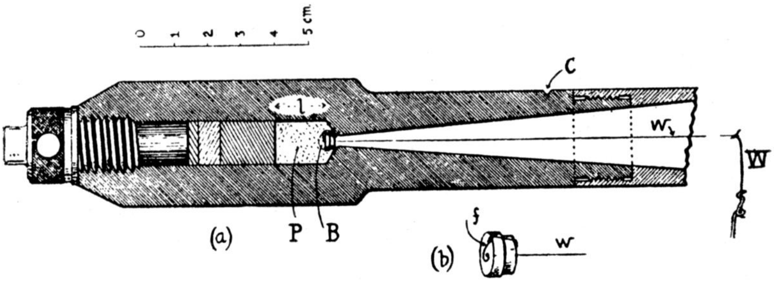

FIG. 1. Sectional View of Goddard's Experimental Rocket

The efficiency of an ordinary rocket is very low, not more than 2%. An improved type of rocket was devised by Dr. Goddard, shown in Figure 1. This was constructed of steel, with a tapered nozzle, so as to secure the advantage of the work done by the expansion of the gas of the discharge. The chamber, *P*, held varying amounts of smokeless powder. By various methods of measuring the recoil, and by many experiments, the efficiency of the rocket was determined both in air and in a vacuum.[3] In the most favorable cases velocities of gas discharge were obtained ranging from 7,000 to nearly 8,000 feet per second, a velocity higher than ever before secured by man for any appreciable mass of matter. Efficiencies of from 50% to 64% were found, indicating that the device has by far the highest efficiency yet attained for a heat engine, that of the Diesel internal combustion engine being about 40%.

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[2] A Method of Reaching Extreme Altitudes, by Dr. R. H. Goddard, Clark College, Worcester, Mass. Smithsonian Miscellaneous Collections, Vol. 71, No. 2, 1919.

[3] The effect of the air-recoil is negligible. Such a rocket will be practically as efficient in a vacuum as in air.

From these results, and from theoretical considerations, Dr. Goddard next calculates the initial mass of powder and rocket necessary to raise one pound of final mass to various heights. Taking the highest velocity of discharge secured in his experiments, and assuming that the rocket starts from sea-level, his results are:

Greatest altitude attained	Time to reach greatest altitude	Total initial mass required for one pound of final mass.
35 miles	144 seconds	3.7 pounds
115 "	266 "	6.4 "
437 "	475 "	12.3 "
infinity	...	1274 "

For reaching extreme altitudes, a system of multiple charges is planned for the rocket, by which charges of explosive are ignited in succession, and whereby useless portions of the powder chambers are also cast off, so as to provide for a relatively small final mass. It is found by calculation that a very small parachute device will be sufficient to provide for the safe descent of meteorological instruments, even if carried up several hundred miles.

Dr. Goddard deems it *theoretically* possible to send such a rocket beyond the force of the Earth's attraction, i. e., to infinity. The only way to tell whether such a projectile had actually passed beyond the Earth's attraction would be to "fire" it against the dark surface of the new Moon, provide sufficient extra powder to produce a flash on impact, and watch for this flash with a telescope. This would require a rocket of an initial mass of about seventeen tons. This idea is suggested as a speculation, rather than as a possibility, by Dr. Goddard.

Even if it were possible to construct a rocket capable of passing beyond the influence of the Earth's attraction, there would be innumerable difficulties in actually striking the Moon. It would seem that the least inaccuracy of aim, the least irregularity of air resistance when near the Earth, failure to account precisely for the Moon's orbital motion or the Sun's disturbing attraction, or the least lateral or otherwise irregular impulse of an exploding charge, would cause the projectile to miss its target.

The experiments made by Dr. Goddard may conceivably be of great value, however, in exploring those remote regions of our upper atmosphere far beyond the present range of sounding balloons (about 20 miles). It should be emphasized, also, that the investigation is still in the experimental stage, and that no rocket of this type has yet been actually constructed.